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ABSTRACT

This booklet for parents summarizes the curriculum at the University of Tulsa School for Gifted Children in Oklahoma. Program goals are to: (1) enhance academic achievement; (2) provide an emotionally supportive and intellectually challenging atmosphere; and (3) develop a creative and positive approach to school learning. A major premise of enaction theory, on which the curriculum is based, is that learning is facilitated by the use of active and interactive methods within a thematic content approach. Maximum utilization of university resources as well as a variety of other proven instructional strategies also characterize the curriculum. The curriculum of each of the five lower school divisions (early childhood through Intermediate I) is described in terms of overall approach, language arts, math, science, social studies, work areas or individual projects, and special subjects. More detailed descriptions are given for the curriculum at the older intermediate levels in the subject areas of math, physical education, kumon (a method of teaching computational skills), language arts, and social studies. Special subjects taught across levels are also described, including computers, Spanish, music, drama, art, kumon math, library, resource room, and science. A scope and sequence chart concludes the curriculum description. The document ends with an article reprint, "Enaction Theory: A Theoretical Validation of the Enrichment Triad Model" by Patricia L. Hollingsworth. Contains 18 references. (DB)

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THE UNIVERSITY SCHOOL ENACTION CURRICULUM

Edited by Patricia L. Hollingsworth, Ed. D.

1994-95

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THE UNIVERSITY SCHOOL ENACTION CURRICULUM

The University School Enaction Curriculum is designed to meet the special needs of able learners by developing their capacities for thinking and problem solving and providing stimulating and challenging knowledge. The Enaction Curriculum is a curriculum based on Ohlsson's theory and Glaser's position on domain specific knowledge. Enaction Theory provides a framework for curriculum planning that emphasizes active, interdisciplinary learning.

PROGRAM GOALS

Our goals are to 1) enhance academic achievement, 2) provide an emotionally supportive, yet intellectually challenging, atmosphere, and 3) develop a creative and positive approach to school and learning.

Enaction Curriculum. A major premise of the curriculum is that learning is facilitated by the use of active and interactive methods, such as drawing, simulations, models, and role playing. Once a basic concept has been introduced the next step involves extending and refining that concept. The third step focuses on what has been learned that would be useful in future problem solving. Step three involves evaluation of what was learned, how it was learned, and how the knowledge might be used in a meaningful way.

The Importance of Content. Coupled with the process-oriented Enaction Theory is an emphasis on thematic content. This content emphasis was selected because research has found that thinking is strongly influenced by experience with new information. It has been found that expert problem solvers are those with conceptual and procedural knowledge in a specific content area. Problem solving, comprehension, and learning are based on knowledge. There can be no problem solving, evaluation or thinking without subject matter, content, or knowledge. Productive thinking, planning, decision making, communication, and forecasting are taught at University School through content areas using the Talents Unlimited model. In addition, students are encouraged to pursue their academic interests with in-depth independent study and research projects following the Renzulli Triad model.

The University Connection. Another essential component of the curriculum involves making use of our relationship with the University of Tulsa. The University Connection consists of T.U. Exploration, in which children visit classes, professors, staff, students, and exhibits, and T. U. Input, in which those resources come to us. Our relationship with the University provides us with numerous unique resources that few schools can match.

Other Curriculum Strategies. The Enaction Curriculum, while providing structure and direction for our curriculum, is flexible enough to encompass a variety of other research-based approaches with national and international recognition. Math and reading strategies that research has shown to be effective are used. We use Renzulli's Triad Enrichment approach to children's independent investigations and Talents Unlimited to develop students' multiple talents. The *Developing Capable Young People* approach and classroom meetings are used to teach children to solve their own problems and develop responsibility. We use the hands-on approach of *Math Their Way* and *Mathematics a Way of Thinking* to augment Kumon math. The organic, whole language approach to reading and writing, which we developed and use, is called "Word Work." Our unique curriculum system is open to using approaches that have proven to be effective.

Teachers as Learners. The teachers at University School are involved in on-going learning experiences for personal and professional growth. They attend and participate in professional conferences, workshops, university courses, and in-service staff development. The love of learning is an important attitude that is conveyed by the entire staff.

Curriculum Change, Growth and Revision. The description of curriculum which follows is our most current format; however, all programs are subject to change without prior notice. As we continue to learn, we continue to grow and change. Our curriculum is not static, but dynamic and responsive. The curriculum at University School is constantly being revised to better meet the needs of the students we serve. All of education is an experiment.

Values. While the specifics of our curriculum change, our values do not.

- We want our students to love learning, to love life, and to respect and care for all living things.
- We want our students to value the gifts given them and to share those gifts responsibly with the world.
- For these things to happen, we as teachers and parents must teach and model these values.

Our goal is for teachers, staff, parents and students to strive toward making these values work in our lives.

Faculty and Staff. In addition to the lead classroom teacher and assistant teachers, there are computer, music, Spanish, art and science consultants. Administrative personnel include: Dr. Pat Hollingsworth, Ed.D., Director; Marti Sudduth, Assistant Director/Admissions; Johnna Girod and Susan Roberts, Administrative Assistants; and Elizabeth Giddens, and Sara Pilgrim, Graduate Assistants.

Office Hours: 8:30 A.M. to 3:00 P.M.

IMPORTANT RULES

Written Withdrawal Notification, An Essential. When parents decide to permanently remove children from University School, it is absolutely essential that notification be given in writing. Tuition billing continues until the school receives notification in writing. You will be held responsible for all tuition that is billed to you. This is part of your written contract.

Appropriate Behavior. It is a privilege to be a student at University School. This privilege is for students who can benefit from the experience and who are able to maintain appropriate behavior. Violent behavior, of any kind, is not tolerated. Kicking, hitting, biting or other violent behavior is strictly forbidden.

Fines. Students are to be at school only during school hours. Parents of students who are brought too early or left too late will billed appropriately.

School Hours: Early Childhood through Primary III - 9:00 to 2:30
Intermediate I through Older Intermediates - 8:45 to 2:45

Students may begin arriving 10 or 15 minutes prior to class but will generally stay outdoors until class begins so that teachers may prepare for the school day.

EARLY CHILDHOOD

Teachers:

Debi Foster Since 1985
University of Oklahoma, B.F.A., Art Ed.
Math Their Way Workshop
Math Their Way Follow-up
Baratta-Lorton Reading Workshop
NAGC - Little Rock, Kansas City
OAGCT - Tulsa, Okla. City
Teacher U.S. Dept. Ed. Javits Grant '93, '94
Presenter NAGC - Atlanta '93
Presenter OAGCT - Okla. City '94

Alicia Parent Since 1988
University of Oklahoma, B.S., Early Childhood Ed.
Math Their Way Workshop
Math Their Way Follow-up
Whole Language Conference, St. Louis
Baratta-Lorton Reading Workshop
NAGC - Little Rock, Kansas City
OAGCT - Tulsa, Okla. City
Teacher U.S. Dept. Ed. Javits Grant '93, '94
Presenter Javits Conf. - Washington, D.C. '93
Presenter OAGCT - Okla. City '94

Graciela Valderrama Since 1994
University of Tulsa, B.F.A.
Teacher US Dept. of Ed. Javits Grant '94

The Early Childhood curriculum has been developed as a two-year cycle so that children cover different material each year. While the Early Childhood curriculum seeks to challenge children intellectually, there is no pressure or push into the academic areas. Teachers are sensitive to the individual development of young children and know appropriate learning experiences for them. The goal of the program is to maximize the social, emotional, physical, and intellectual development of the children. Children are encouraged to be active, independent, and creative learners while also learning to be responsible and cooperative.

LANGUAGE ARTS
Children are encouraged to express and develop their ideas orally during group time through the use of the Talents. Children develop a high level of proficiency in Productive Thinking and Decision Making, which fosters creative and problem-solving abilities.

Children are introduced to upper and lower case letters and to their sounds. This is done through the use of Sound Books. As children become developmentally ready, they begin the organic, whole language method of reading and writing called "Word Work," which is used throughout the school. Children receive words of their choice, which form the content of reading and writing. This method provides individualized reading and writing material for each child. Children also dictate stories for teachers to write for them.

MATH
Children begin use of *Math Their Way* materials with free exploration, sorting, and patterning. Children are also introduced to estimation, the number line, graphing, calendar work, recognizing numerals, one-to-one correspondence, and numbers at the concept level. The *Math Their Way* approach is in keeping with the Enaction Curriculum in that it provides active, hands-on, learning experiences.

SOCIAL STUDIES AND SCIENCE
The theme for Early Childhood is "Investigating Our World." Units include Becoming Responsible, Working Together, Textures, Animals, Our Bodies, Magnets, Seasons, Nature and Environment, Opposites, Colors, and Solids and Liquids. Students are encouraged to observe, describe, compare, and classify.

INDEPENDENT AND REQUIRED WORK
Each week children have a list of required work, called "Must Do Work," that they are to complete. Also, there is ample time for selection of independent work, which includes a wide variety of arts and crafts, sand and water table materials, block building, other manipulatives, games, and books. Children develop a responsible approach to work in that they learn to carry out some teacher-directed activities, but also remain self-directed when appropriate.

SPECIAL SUBJECTS
Children also have classes in computer, music, art, and Spanish. See SPECIAL SUBJECTS section.

PRIMARY I

Teachers:

Patrícia Hollingsworth Since 1982
Florida State University, B.S., Education
University of Tulsa, M.T.A., Art Ed.
University of Tulsa, Ed. D., Ed. Admin
Graduate Work:
George Washington University
University of Florida
University of Oregon
SOI Institute Workshops, Advanced Trainer
Post-Graduate Work with Renzulli,
University of Connecticut
Gifted Education Endorsement, OK and FL
Director U.S. Dept. Ed. Javits Grant '93, '94

Keith Anne Gaddy Since 1985
Okla City University, B.A. Early Childhood Education
Certified Montessori Teacher
Teacher U.S. Dept. Ed. Javits Grant '93, '94
Presenter, Javits Conf., Washington, D.C. '93

Lucille Kelly Since 1985
Arkansas Tech University
YWCA Admin. Training - S.M.U. & St. Louis
ORU HPER Courses
Northwestern University HPER
OAGCT - Tulsa, Okla. City
NAGC - Little Rock, Kansas City

LANGUAGE ARTS

The Phonetic Approach. The content of the Primary I curriculum is thematically focused on the Letter Sound of the Week. Each week a specific letter sound is selected for study. Children learn to distinguish between letter-name and letter-sounds. Children learn vocabulary words that begin with the letter-sound, science and social studies topics that begin with the letter-sound, and learn to write the letter. During the first semester, the easiest and most common consonants plus the short vowels are studied. During the second semester, the less common consonants, blend sounds, and long vowels are studied. Each day students are individually evaluated to discern the level of phonetic attainment.

Organic, Whole Language Reading and Writing: Word Work. Primary I builds on the skills developed in Early Childhood in organic reading and writing. Students begin the school year by getting a new word each day of their own choosing. These words form the basis of the writing and reading done in class each day. When the student is both reading and writing the words with ease, sentence writing is introduced. By the end of the year, students are writing stories each day using their own personal dictionaries. The important thing about this method of reading and writing is that the content is meaningful and motivating because it comes directly from the children and their experiences. The handwriting method is D'Nealian, which is used throughout the school.

MATH

Math Their Way is a concrete, hands-on method of teaching number skills. The method provides a variety of three-dimensional materials that are used to teach counting, addition, and subtraction. Children are assessed to determine their entry level and then periodically assessed throughout the year. A wide variety of other math manipulatives, such as geoboards, patterning materials, centimeter cubes, and math games are also available in the math area. Children begin using Kumon which helps students learn to focus their attention, as well as learn basic math skills.

SCIENCE

The Primary I Science Curriculum is based on the modified spiral pattern used throughout the school. The theme is "Exploring Our World." Topics to be introduced are: Insects, Birds, Reptiles, Amphibians, Mammals, Botany, and Actions and Reactions of Water and Air. Students are encouraged to become actively involved in collecting information, experimenting, and drawing conclusions. The Talents, such as Productive Thinking, Communications, and Forecasting are often used in science.

SOCIAL STUDIES

The Primary I Social Studies theme is "Ourselves and Others," which involves comparing our lives with those of others, both past and present. Students are introduced to a variety of historical figures related to the "letters of the week" and holidays that we celebrate. The lessons begin with stories, films, songs, and pictures about the event and move to the children reenacting the historical event. Often these dramas are produced for parents and other students, but some are performed just for the class itself. The people and events introduced include Columbus, the Pilgrims, George Washington, Martin Luther King, Abraham Lincoln, Queen Victoria, Queen Elizabeth I, King Henry VIII, and the Oklahoma Land Run.

Geography. The people and events studied are a natural lead-in to the study of other countries. Students begin by learning the location of Spain and Italy during the study of Columbus. By the end of the school year most of the students can locate all of the continents. Young children have a great curiosity about our world and enjoy learning about maps and globes. The following are included in our studies: Italy, Spain, Japan, China, Ireland, Asia, United States, Oklahoma, and Egypt.

Cooking. A variety of cooking activities are planned and implemented by the students. Students learn to use the Planning Talent prior to the cooking event so that all goes smoothly. With teacher help, students have made soup, pretzels, granola, jello letters, and many other dishes.

WORK AREAS

Each morning students work with a teacher in the Math Area, the Language Arts Area, and a combined Science and Social Studies Area. When students are not working directly with a teacher they are free to make choices of work in the Independent Work Area. The Independent Work Area is comprised of the Dramatic Play Area, the art easel, the science table, plus a variety of art materials and manipulatives.

SPECIAL SUBJECTS

Students also have classes in computer, music, art, Spanish, and participate in Talent development. For a description of those courses, refer to the section called SPECIAL SUBJECTS, following the CLASS LEVEL descriptions.

PRIMARY II

Teachers:

Marti Sudduth Since 1985
Northeastern State University, B.S.,
Early Childhood Education
Kumon Training
Shurley Grammar Training
Administrator U.S. Dept. Ed. Javits Grant '93, '94

Sara Pilgrim Since 1994
University of Oklahoma, B.F.A.
Dance Teacher
University of Tulsa, MA in progress
Graduate Assistant U.S. Dept. Ed Javits Grant '94

The curriculum in Primary II builds upon the basic skills and foundations initiated in Early Childhood and Primary I. Reading, writing, social studies, and science are taught on a group or individualized basis depending on which is the most effective learning experience.

LANGUAGE ARTS
Oral reading in small groups occurs daily. Reading is taught in a variety of ways in order to meet the children's individual needs. Mastering good comprehension skills is an important part of the reading program. D'Nealian handwriting skills, punctuation, and parts of speech, are slowly introduced and improved upon during the year through "Word Work," a whole language approach to writing and reading. Primary II students continue writing stories each day with the use of their own personal dictionaries. Students work on editing and revising their written stories with the use of skills learned throughout the year. Silent reading is always encouraged.

MATH
Math in Primary II incorporates Kumon math (see Special Subjects) and *Math Their Way*. Students build upon and extend their skills in addition and subtraction. The basics of measurement, fractions, money, and time will be taught. A variety of math manipulatives are used to make the learning of concepts meaningful.

SCIENCE
The Primary II science theme is "Investigating Changes Around Us." Topics included are: Weather, Insects, Save the Earth, the Rain Forest, Plants, Dinosaurs, the Human Body, Oceans, and Life Cycles. The purpose of Primary II science is to develop inquiry skills needed for scientific investigation.

SOCIAL STUDIES
"Living Together at Home and at School" is the Primary II Social Studies theme. Units include: Celebrating Diversity, Native Americans, and Famous Americans. Important historical events are discussed as they arise.

INDIVIDUAL PROJECTS
During the second semester each student will do research and develop individual projects in conjunction with some of our Science and Social Studies Units. Students will use the "Talents" to carry out these projects. These activities will be age appropriate but are one of the first steps in developing their abilities to take information obtained and transfer that to a product which shows what they have learned.

SPECIAL SUBJECTS
Students also have classes in music, Spanish, computer, art, and work with the Talents. Please refer to the SPECIAL SUBJECTS section for a description.

PRIMARY III

Teachers:

Melanie Kelsey 1989 & since 1993
Northeastern State University, B.A.,
in Elementary Education
UCAT, M.T.A. in progress
Kumon Training
Great Books Training
Teacher U.S. Dept. Ed. Javits Grant '93, '94

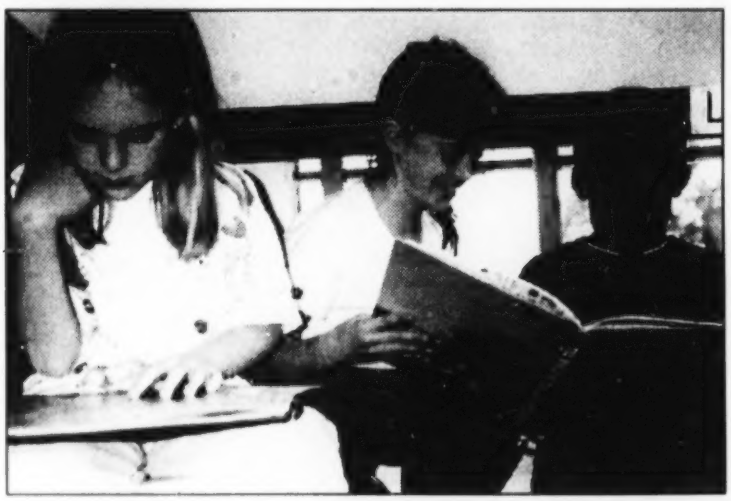
Priscilla Langenderfer Since 1993
University of Tulsa, B.A., Music Education

LANGUAGE ARTS/SHURLEY GRAMMAR
Students write in their individual journals daily. Upon completion of a story, editing and publishing follow, allowing students to use the grammar and handwriting skills learned in class. Spelling words are derived from personal dictionaries, unit vocabulary, and phonetic study. D'Nealian handwriting skills are reinforced and cursive handwriting is introduced. The parts of speech, sentence patterns and primary grammar rules are taught with the Shurley Grammar method. Students read aloud daily in small groups. Reading materials include a variety of literature (prose and poetry) designed to accommodate a range of abilities and interests.

MATH
Concepts and foundations are developed through Kumon (see Special Subjects), *Math Their Way*, *Miguon* and the *Addison-Wesley Mathematics* series. Students extend their learning in such areas as graphing, multiplication and division facts, fractions, estimation, measurement, geometry, patterning, money, time, story problems and simple algebraic equations.

SCIENCE
Students have science with Mrs. Block. During those classes, as in all the Science classes, Primary III makes continual use of the Talents. For example, the class uses the Productive Thinking Talent and the Decision Making Talent in deciding many, varied, and unusual ways to moisten plants. Then students use the Forecasting Talent to predict the outcome of using particular moistening agents. Students use the Planning Talent and the Communication Talents in observing and recording the Process. Hands-on activities are an integral part of the class. Some of the natural phenomenon which students will observe, predict, and record are: heat rising, influence of temperature on air and states of matter (liquid, solid, and gases).

The goals of Primary III Science are that students enjoy science and become careful observers. These goals will also be enhanced during classroom center times.



SOCIAL STUDIES
Students learn about the USA and other countries. Students will gain knowledge of a country's customs, culture, language, geography, and economics. Students will also learn about our city and state governments.

SPECIAL SUBJECTS
Students also have classes in Spanish, computer, music, art, and develop multiple Talents. Please refer to the SPECIAL SUBJECTS section for a description.

INTERMEDIATE I

Teachers:

Kim Harper Since 1990
Oklahoma State University, B.S., Lang. Art
Teacher Observation Seminar, Colombia, S.A.
Kumon Training
Shurley English Grammar Training
Teacher U.S. Dept. Ed. Javits Grant '93, '94
Presenter, NAGC, Atlanta '93

Cathy Freeman 1986-88 & since 1990
University of Houston, B.A., Music Education
Teacher, U.S. Dept. Ed. Grant '93, '94

Julie Nierenberg 1988-92 & since 1994
Earlham College, B.A., Biology
University of Tulsa, MA, Gifted Ed.

LANGUAGE ARTS

Reading. The reading program uses children's literature, primarily Newbery Award and Honor Books, general literature and poetry to provide varied subjects, levels, and types of reading. Activities build on previously acquired skills in phonetic analysis, comprehension development, and higher level thinking skills. Skills needed for reading in the content areas are emphasized.

Spelling. The spelling program provides a systematic approach to sound-spelling relationships based on patterns or structure of words. Group instruction is used to introduce spelling patterns and structure, and students will be grouped according to their abilities. Vocabulary building is an important part of spelling and is emphasized in Intermediate I.

Writing. The continuation of the organic, whole language method of reading and writing, "Word Work," provides reinforcement of grammar and punctuation skills on an individual basis. Both oral and written reports provide extended practice for correct language usage. Students continue to master D'Nealian manuscript and begin D'Nealian cursive as they demonstrate readiness. Weekly Writers' Conferences continue to help students learn to clarify and revise their written work. Emphasis will be placed on sentence structure and paragraph writing. Poetry is another important aspect of writing in this class

MATH

Kumon, Mortensen Math, Mathematics a Way of Thinking, and the *Addison-Wesley Mathematics* series form the basis of the Intermediate I Math Curriculum. Students work on maintaining and developing computation skills in addition, subtraction, multiplication, and division. Work on time, estimation, measurement, money, geometry, and graphing continue. Students are introduced to decimals and simple probability.

SOCIAL STUDIES

Students continue to develop their knowledge and understanding of Medieval and Renaissance Europe. The objectives of the program are to develop critical thought and inquiry. Students enhance their knowledge of significant events, persons, and ideologies shaping these periods of history. Materials utilized will include biographies, maps and historical fiction.

SPECIAL SUBJECTS

Students also have classes in art, music, computer, Spanish, science, Kumon and learn to use the Talents. Please refer to the SPECIAL SUBJECTS section for a description.

THE OLDER INTERMEDIATE CLASS

The Older Intermediate Class consists of fourth through eighth grade students who travel to departmentalized classes. Students attend three morning classes and four afternoon classes. Though these classes might seem segmented they are quit interdisciplinary in that teachers coordinate lessons so there is great reinforcement of concepts and ideas. The structure of the Older Intermediate Class is rigorous and demanding. It develops and requires students who are mature , focused and responsible.

OLDER INTERMEDIATES: Math

Teacher:

Marilyn Howard Since 1984
University of Tulsa, B.S., Mathematics
Indiana University, M.A., Mathematics
T.U. Summer Institute, Statistics and Probability, 1989
Kumon Training, Houston, TX, and Tulsa, 1990
Teacher U.S. Dept. Ed. Javits Grant '93, '94

MATH
Basic math concepts and facts are introduced and reinforced through the self-paced Japanese method of instruction known as Kumon. Please refer to the SPECIAL SUBJECTS section for a more complete description. Math class is largely devoted to problem solving strategies, geometry, probability and statistics, and other topics that are not covered in detail in Kumon.

A concrete, "hands-on" approach is used for introducing most new topics from 4th grade math through pre-algebra. Manipulatives such as pattern blocks, unifix cubes, pentominoes, cuisenaire rods, tangrams, dice, cards, and calculators help to enrich our math program.
Several Texts are used including: *Addison Wesley Mathematics, HBJ Mathematics, Heath Algebra I,* and *McGraw-Hill Mathematics.*

OLDER INTERMEDIATES: Kumon

Teacher:

Cyndie Kidwell
Tulsa Jr. College associate degree in process
Kumon training
Teacher U.S. Dept. Ed. Javits Grant '93, '94

KUMON
Kumon Math is an individualized, self-learning approach to math that emphasizes repetition, speed, and accuracy. Developed over 35 years ago in Japan by Toru Kumon to help his son, Kumon helps students internalize basic math skills, such as multiplication tables and division of fractions.

Older Intermediates have Kumon four times a week if they are not on grade level. Those who are on grade level have a class of their choice once a week.

OLDER INTERMEDIATES: Language Arts and Enrichment

Teachers:

Katie Abercrombie Since 1990
University of Oklahoma, M.B.A.
University of Oklahoma, B.S., Journalism
Tulsa Tribune, Reporter
Tulsa Jr. College, Writing Instructor
Shurley English Grammar Training
Teacher U.S. Dept. Ed. Javits Grant '93, '94

Dawn Alvord Since 1993
University of Tulsa, Speech Pathology and Elementary Ed. in progress
Teacher U.S. Dept. Ed. Javits Grant '93, '94

LANGUAGE ARTS

Writing Workshop - Creative and Essay Writing. Students' compositions, poetry, and prose are used as a basis for individualized teaching of spelling, editing, handwriting, and vocabulary. Students work individually and with a partner drafting revisions and improvements until a final copy is submitted. Word processing skills are taught and used during composition and editing. Daily lessons model the necessary composition and writing mechanics skills for development of independent writing abilities.

Some student work is bound into book form. Older Intermediates are encouraged to share their works with classmates as well as younger classes. This sharing provides reinforcement of oral reading skills and leads to the development of a positive self-concept. Students will periodically submit their writing to children's publications to gain experience in seeking a wider audience. Student-authored books (of appropriate content) are added to our permanent library collection.

Reading - Response Writing. The core material consists of outstanding works of children's literature and Junior Great Books. Basic reading, decoding, and analytical thinking skills are taught and reinforced through silent and oral reading, followed by a written response to the day's reading portion. Evaluative comparison exercises are given (book reports and reviews, essay questions, dramatic portrayal, and other ways of conveying content comprehension).

Enrichment. Individual and group activities include three types of enrichment:

Type I Exposure to a wide variety of informational resources allows students to explore and assess their interests. Printed matter, guest speakers, visual presentations, and field trips are utilized to introduce new concepts.

Type II Skill development to enable independent learning is tailored to the interests and abilities of students. Students learn to locate, interpret, and classify information and to use a personal filing system.

Type III Research, conducted individually, culminates in multimedia products for presentation to an audience. The pace, scope, and product requirements are tailored to the research project. Written reports are required from all students.

GRAMMAR AND WRITING SKILLS

Designated class time each week is set aside for small group lessons. The patterns, formation rules, and categories of English words and sentences are systematically taught with the Shurley English System. Appropriate reinforcement exercises are given for each grade level. Remedial needs are targeted for further individualized instruction.

Whenever possible, grammar and other skills are connected and applied to student writing. Students analyze and correct their individual writing patterns. Participation in and mastery of drills are encouraged by rotating student Shurley "teachers."

STUDY SKILLS

Students are taught strategies throughout the year for setting study priorities, planning time for long term and short term projects, maintaining a homework assignment notebook, and staying personally organized. Notetaking and test preparation skills are also covered.

OLDER INTERMEDIATES: Social Studies

Teacher:

Elizabeth Giddens Since 1993
Trinity University, B.A. Psychology
University of Tulsa, MBA in progress
Graduate Assistant U.S. Dept. Ed. Javits Grant '93, '94

SOCIAL STUDIES
Students continue to develop their knowledge and understanding of history, geography, government, economics, and sociology of the United States and of the world. The objectives of the social studies program are to increase students' awareness in these five areas as well as to develop a creative spirit of inquiry toward their conduct of independent investigations.

Compacting will be used to allow students to move through material at an individual pace. The compacting method will help students to develop their knowledge and skills in each subject through group and individual reading, assignments, lectures, and culturally-based independent, or small group, research projects. Students will take an exam at the beginning of each unit. Those who score highly on the exam will be allowed to select individual projects in the subject area. The remaining students will continue studying the unit's content until they demonstrate mastery of the content. At the end of each unit all students will take an essay exam over the material. Some examples of the units include: native peoples of the Americas, exploration of the Americas, colonization, the Revolutionary War, westward expansion, the Civil War, and the United States involvement in world affairs.

Each unit will include a simulation in which students will dramatize important historical events and develop practical living skills. For example, the Galleon is a simulation in which students experience the quest for gold aboard a Spanish galleon. Students will meet Magellan, Cortes, Pizzaro, and DeSoto. They will gain knowledge and skills in history, geography, and map reading as they travel across the ocean.

Materials used:
Our History, Holt, Rinehart, and Winston.
Scholastic series: *Biographies form Value Communications, Inc.*
Scholastic series: *Success With Maps*
Selected reading, primary source materials, documents, historical interpretations.

SPECIAL SUBJECTS
Older Intermediate students also take music, art, computer, science, Spanish, and talent development. Please refer to SPECIAL SUBJECTS section for descriptions.

OLDER INTERMEDIATES: Physical Education

Teacher:

Cyndie Kidwell Since 1990
Tulsa Jr. College associate degree in process
Kumon training
Teacher U.S. Dept. Ed. Javits Grant '93, '94

PHYSICAL EDUCATION
The course endeavors to improve both individual skill levels in basic movements through running and aerobics, and teamwork (volley ball, basketball, softball, etc.). Physical education classes offer an excellent opportunity to develop social skills, leadership, and conflict resolution. The major objectives of the course are to provide the student with the experience of the enjoyment of developing his or her physical potential, to develop specific skill competencies, and to enable the student to function well in a group situation.

SPECIAL SUBJECTS: Computers

Teachers:

Marilyn Howard Since 1984
University of Tulsa, B.S., Mathematics
Indiana University, M.A. , Mathematics
Mathematics: A Way of Thinking Workshop
T.U. Summer Institute, Statistics & Probability, 1989
Kumon Training, Houston, TX, and Tulsa, 1990
Teacher U.S. Dept. Ed. Javits Grant '93, '94

Dawn Alvord Since 1993
University of Tulsa, Speech Pathology
and Elementary Ed. in progress
Teacher U.S. Dept. Ed. Javits Grant '93, '94

Hardware:

12 IBM PcJrs., 2 Apple II GS, 2 Apple IIe, 1 Macintosh Plus, and 1 Macintosh SE with a 20 meg hard disk, AT Clone with a 20 meg hard disk and internal modem for data logging, 2 ImageWriter II printers.

EARLY CHILDHOOD and PRIMARY I COMPUTER

The goal for children at this level is a positive learning experience with the computer. A variety of educational programs helps familiarize the students with the keyboard, and develop math and reading readiness skills. The instant version of LOGO, a list processing language, is introduced.

PRIMARY II AND PRIMARY III COMPUTER

At this level, the children recognize the computer needs instruction. They can follow a procedure for a familiar task, and can modify a procedure or find and correct errors in a procedure. Basic computer vocabulary and computer applications are introduced. Students begin to learn the full LOGO commands such as: FORWARD 10, RIGHT 90, CLEARSCREEN, etc.

They use LOGO to write simple procedures.

INTERMEDIATE COMPUTER

Students practice correct keyboarding techniques and learn to use the following tools:
Word Processor, Database Manager, Graphing Assistant, Spreadsheet.

They build on what they have learned in LOGO, developing procedures involving repetition, decision making, and variables.

The students learn to program in BASIC utilizing FOR-NEXT loops, IF-THEN statements and variables. Using what they have learned, the students modify existing programs and write their own programs.

In addition, they begin to learn about the internal workings of the computer. Students learn the binary number system and build databases for class use.

The students use a variety of educational software including:
Drill and practice programs
Simulations
Computer Aided Instruction (CAI)
Problem solving programs
Adventure games

SPECIAL SUBJECTS: Spanish

Teachers:

Millie Flores Since 1992
Certificate in Nursing, Lima, Peru
Kumon training

Graciela Valderrama Since 1994
University of Tulsa, B.F.A.
Teacher U.S. Dept. Ed. Javits Grant '94

EARLY CHILDHOOD AND PRIMARY I SPANISH
During the school year children build a basic vocabulary in Spanish by learning greetings, animals, foods, numbers, colors, and the Spanish alphabet. Games, rhymes, and songs are introduced to reinforce prior learning and to make Spanish interesting and enjoyable. It is important for children to be introduced to a foreign language at a young age. Young children acquire a second language with fewer of the diction and pronunciation problems of older learners.

PRIMARY II AND PRIMARY III SPANISH
The students build on previously learned vocabulary by orally answering and asking questions in complete sentences in Spanish. They participate in spontaneous and memorized Spanish dialogues. Students play games, learn rhymes, and sing songs in Spanish, as well as learn a variety of aspects about Spanish and Hispanic culture. The goal for the children at this level is extensive development of listening and speaking skills in Spanish. Text are *Hablan los Ninos* and *A Taste of Language*.

INTERMEDIATE I SPANISH
Building on the vocabulary previously acquired in Spanish, the students use the textbook, *Bienvenidos Spanish for Mastery A*, to improve listening and speaking skills. A variety of cultural aspects of Spanish-speaking peoples, such as history, arts, songs, rhymes, and games are studied. Students use the Language Lab and *Exploring Spanish* to reinforce both oral and writing skills.

OLDER INTERMEDIATES SPANISH
Students begin by reviewing and building on previously learned oral and written skills and move toward more advanced Spanish conversation, grammar, reading and writing. Additionally, students learn Hispanic history, culture, and geography. Students also use the Language Laboratory and the monthly Spanish magazine, *¿Que Tal?* to practice oral-aural skills. Texts used include *Bienvenidos*, *Día a Día*, *Mucho Gusto*, and *Spanish is Fun*.

SPECIAL SUBJECTS: Developing Multiple Talents

DEVELOPING THE TALENTS
The development of multiple talents is a high priority at University School. The model used throughout the school is Talents Unlimited, based on Calvin Taylor's research and developed by Carol Schlichter. The talents of 1) Productive Thinking, 2) Planning, 3) Communication, 4) Decision Making, and 5) Forecasting, are taught within the context of the academics. For example, to teach productive thinking in math, students might be asked to think of the many, varied, and unusual ways that fractions can be used. To teach planning in social studies, students might be asked to plan the cargo that Columbus should have carried with him. Each one of the Talents has specific steps to be learned and is always taught within academic content. All classroom teachers are involved in teaching the Talents.

SPECIAL SUBJECTS: General Music

Teacher:

Cathy Freeman 1986-88 & since 1990
University of Houston, B.A., Music Education
Kodaly and Orff training, Spring Branch - ISD Houston, Texas
Kodaly and Orff workshop, Houston Texas
Choristers Guild Seminars, Dallas, Texas, and Carthage College,
Grand Rapids, Michigan and Kenosha, Wisconsin
OAKE National Conference, Norman, OK
Teacher U.S. Dept. Ed. Javits Grant '93, '94

GENERAL MUSIC

General Music is a course intended to provide a variety of sequentially arranged activities through which students may acquire concepts of rhythm, melody, harmony and texture, form and timbre. The Kodaly and Orff methods of music education are used at University School with both intermediate and primary children. The Kodaly method is used to teach students to read music notation using solfege and hand signs. Students study a variety of musical styles but the core of the music curriculum is American folk music.

The Orff approach to elementary music learning addresses every aspect of musical behavior: performing, creating, listening, and analyzing. It combines singing, movement, speech and the playing of Orff instruments to learn improvisation and musical sensitivity. The soprano recorder is also used in the intermediate classes.

Course Goals:

1) Students will demonstrate understanding of musical concepts by performing, reading, writing, analyzing, and creating.
2) Students will study melodic and rhythmic concepts in sequences of difficulty.
3) Students will demonstrate performance skills both individually and as part of an ensemble.
4) Students will build a vocabulary of musical terms and symbols which will increase with each successive year.
5) Students will demonstrate the social skills necessary to work with other students toward achieving musical goals.

Course Texts:

The Kodaly Method by Lois Choksy. Prentice Hall, Inc. Englewood Cliffs, New Jersey.
150 American Folk Songs by Peter Erdri. Boosey and Hawks, New York, New York.
Simple Gifts Vol. I, II, III and IV by Helen Wyzga.
Music for Little People, by John Feierabend, Boosey and Hawkes, New York, New York.

Many other musical materials are also used in general music.

SPECIAL SUBJECTS: Drama

Teacher:

Graciela Valderrama Since 1994
University of Tulsa, B.F.A.
Teacher US Dept. of Ed. Javits Grant '94

OLDER INTERMEDIATES DRAMA

Students will practice improvisational skills, and skills related to acting. The class will concentrate on the process of collaborative script-writing, from individual work on monologues and duologues. Scripts will be cooperative efforts, especially in their revision, which will result from in-class corrections. Re-writes after classroom rehearsal may be expected to incorporate dialogue. First semester efforts will culminate in the Winter Drama Festival. The second semester's emphasis will consolidate individual work in characterization. Subjects to be dramatized will correlate with subject-matter in history and geography when possible.

Text: *Theatre Games for Young Performers*, Maria C. Novelly

SPECIAL SUBJECTS: Art

Teachers:

Patricia Hollingsworth Since 1982
Florida State University, B.S., Education
University of Tulsa, M.T.A., Art Education
University of Tulsa, Ed. D., Ed. Administration
Graduate Work:
George Washington University
University of Florida
University of Oregon
SOI Institute Workshops, Advanced Trainer
Post-Graduate Work, Univ. of Conn.
Director U.S. Dept. Ed. Javits Grant '93, '94

Nancy Godsey Since 1994
University of Tulsa, B.F.A.
University of Tulsa, M.F.A.

ART
The art curriculum attempts to fulfill the purposes of University School by developing the creative, academic, and social/emotional potential of students. The goals of the program are:

1) for students to learn to creatively express their ideas and feelings visually
2) for students to learn to respond to a wide variety of artistic periods and styles
3) for students to learn ways art has been expressed over time
4) for students to learn to make reasoned judgments about art based on appropriate criteria

Students are introduced to a variety of local artists and art media.

EARLY CHILDHOOD ART - Debi Foster
Art at this level is taught by the classroom teacher, Debi Foster. Emphasis is placed on developing creative self-expression while learning correct methods of caring for materials and equipment.

PRIMARY I ART - Patricia Hollingsworth.
For students in Primary I the main focus is a balance between personal expression and learning to observe. Topics for painting and drawing during the teacher-directed instruction time relate to the topics of study in class and are teacher selected. The way in which the child interprets topics and observations is personal. During independent work time both materials and topics are student choices. Topics include insects, reptiles, amphibians, birds, mammals, and plants. Students observe and draw from living objects as often as possible with personal interpretation continually being valued and encouraged.

PRIMARY II, PRIMARY III, AND INTERMEDIATE I ART - Patricia Hollingsworth
Students continue to draw and paint from observing living objects and interpreting them in their own way. In addition to plant and animal life for topics, students begin drawing man-made objects from life, such as buildings and machinery. The drawing of the human body is continued and developed. Students are introduced to artists that relate to the topics being studied and are introduced to art history through the Human Time Line. *Smart Art*, introduces students to art theories and art criticism, and *Kinetic Kaleidoscope* introduces the concepts of movement and energy in art.

Texts: *Smart Art* by Dr. Pat Hollingsworth and Stephen Hollingsworth. Zephyr Press, Tucson, Az.
Kinetic Kaleidoscope by Gail Herman and Pat Hollingsworth. Zephyr Press, Tucson, Az.

OLDER INTERMEDIATES ART - Nancy Godsey
Because of their more advanced developmental level, Intermediate students begin working on more long-term projects, such as painting and printmaking. Additional emphasis is placed on drawing from observation with personal interpretation. Students are introduced to design problems that emphasize proximity and overlapping.

SPECIAL SUBJECTS: Kumon Math

Each Classroom Teacher Teaches Kumon

Kumon Math is an individualized, self-learning approach to math that emphasizes repetition, speed, and accuracy. Developed over 35 years ago in Japan by Toru Kumon to help his son, Kumon helps students internalize basic math skills, such as multiplication tables and division of fractions. We use Kumon daily with all students Primary I level and older.

Each Student is given a diagnostic test to determine his or her level of mastery, mastery meaning the ability to complete worksheets accurately within a specified time frame. If there are mistakes, students correct them. Worksheets are completed when the student scores 100%. Kumon is extremely sequential, thorough, and systematic. Students master a concept before they move on to another concept.

We emphasize the similarity between Kumon and exercise. For example, a runner might complete a track in 5 minutes. At which time the coach responds, "Good work, now try for 4 minutes." Kumon is like exercise in that if you do it you will like it and get better. If you do not, you will not.

For years, our students have had a good grasp of math concepts. What so many did not have was an internalized mastery of basic computational skills. This is what Kumon does for students.

SPECIAL SUBJECTS: Library/Resource Room

Librarian:

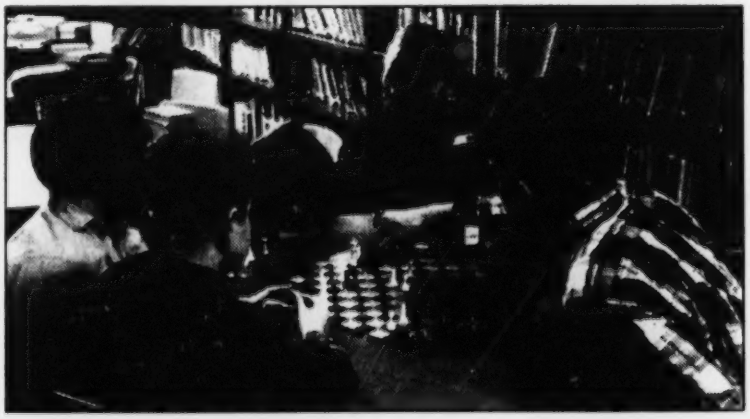
Robyn Bowman Since 1991
Oklahoma State University, B.S. Library Science Education
University of Texas, M.S. Library Science
Network News Quarterly, Production Editor

LIBRARY/RESOURCE ROOM

The University School library is available for all students to use. The goals of the library curriculum are:

1. for students to appreciate and enjoy a wide variety of literature
2. to help students become successful independent learners
3. for students to learn to use a variety of information sources
4. for students to develop abilities to select, evaluate and interpret information in the following formats:
   - Print materials (books, magazines, newspapers, pamphlets, etc.)
   - Non-print materials (pictures, filmstrips, films, video-cassettes, human resources, etc.)
5. for students to develop skills to record, classify and arrange information
6. for students to learn to communicate information in various formats

Students come to the library to have stories read aloud to them, to check out books, and to learn library and research skills. The University School library has an on-line computer catalog as a satellite collection of the University of Tulsa McFarlin Library. The library also has computer access to the Tulsa City-County Library system catalog.



SPECIAL SUBJECTS: Intermediate Science

Teacher:

Sharon Block Since 1987
University of South Dakota, A.A., R.N.
Morningside College, B.S. , Psychology
Former Education Outreach Lecturer for the Margaret Hudson Program
Graduate work, National Science Foundation grant, Tulsa, 1990
Teacher U.S. Dept. Ed. Javits Grant '93, '94

The theme for all Intermediate students in science, "Investigating Our Environment," is part of the modified spiral curriculum plan for University School science. Studies have shown that any topic of science can be taught at any grade level. However it is not possible to teach every science topic every year. The modified spiral plan provides for topics to be introduced and later reintroduced to help insure the development of concepts, knowledge, skills, and maintenance of those.

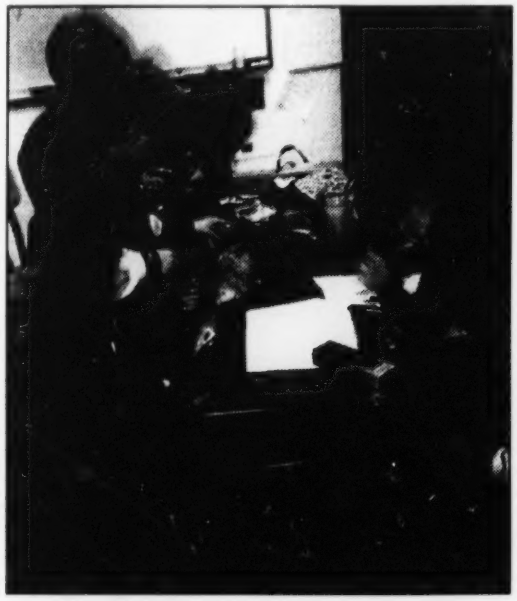
The purpose of the science curriculum is to stimulate observation and curiosity while developing scientific inquiry skills. The course provides a balance between fact-acquisition and problem solving. Experimentation and hands-on learning are stressed. During all units the importance of accurate data record keeping is emphasized.

Goals for Intermediate science students are: 1. to like science, 2. to enjoy learning, 3. to see their place in the environment, 4. to develop a knowledge base in science, and 5. to make science relevant.

INTERMEDIATE I SCIENCE
Intermediate I students study geology, the solar system, plants and animals, including humans; states of matter, physical and chemical changes, and tools.

As in all science classes, hands-on activities, experiences, and experiments are essential ingredients. Students build upon and extend their skills in predicting, observing and recording.

OLDER INTERMEDIATES SCIENCE
Students are actively involved in experiments and experiences. They are encouraged to move beyond the basic experiments into productive thinking, forecasting, problem solving, and the use of contrast and comparison. The spiral curriculum of our science classes allows students to each year build upon and extend their previous skills and knowledge. Topics on pages 20 and 21 are some of the subjects covered. Periodic trips to the University chemistry lab are taught by Dr. Robert Howard, Chair of the Chemistry Department. We also visit the mechanical and petroleum engineering departments. Guest speakers with science backgrounds and/or careers are frequently used to augment the curriculum. Current events in science and a history of science and life are part of the curriculum.



Science, language arts, computers, math, social studies, physical education and music all use across the curriculum strategy at some time during the year. This reinforces information and makes it much more meaningful to our students.

UNIVERSITY SCHOOL
SCOPE AND SEQUENCE:
Language Arts, Math, Etc.

LANGUAGE ARTS	Early Childhood	Primary I	Primary II	Primary III	Intermediate I	Older Intermediate
D'Nealian Handwriting Manuscript		●	●	●	●	●
D'Nealian Handwriting Cursive					●	●
Organic Reading and Writing						
Words	●	●				
Sentences		●	●			
Paragraphs		●	●	●	●	●
Dictionaries			●	●	●	●
Writer's Conference				●	●	●
Literature	●	●	●	●	●	●
Creative Writing	●	●	●	●	●	●
Shurley English Grammar				●	●	●

MATH	Early Childhood	Primary I	Primary II	Primary III	Intermediate I	Older Intermediate
Math Their Way	●	●	●	●	●	●
Kumon Math		●	●	●	●	●
Mathematics a Way of Thinking				●	●	●
Addison-Wesley Mathematics				●	●	●

TALENTS	Early Childhood	Primary I	Primary II	Primary III	Intermediate I	Older Intermediate
Productive Thinking	●	●	●	●	●	●
Forecasting	●	●	●	●	●	●
Planning		●	●	●	●	●
Communication		●	●	●	●	●
Decision Making		●	●	●	●	●

ENRICHMENT TRIAD	Early Childhood	Primary I	Primary II	Primary III	Intermediate I	Older Intermediate
Type I Exploration Activities	●	●	●	●	●	●
Type II Training Activities	●	●	●	●	●	●
Type II.5 Beginning Independent Studies			●	●	●	●
Type III Investigations of Real Problems for Real Audiences					●	●

	Early Childhood	Primary I	Primary II	Primary III	Intermediate I	Older Intermediate
Music	●	●	●	●	●	●
Computer	●	●	●	●	●	●
Spanish	●	●	●	●	●	●
Art	●	●	●	●	●	●
Library	●	●	●	●	●	●

PHYSICAL EDUCATION	Early Childhood	Primary I	Primary II	Primary III	Intermediate I	Older Intermediate
Informal Activities	●	●	●	●	●	●
Formal Instruction				●	●	●

UNIVERSITY SCHOOL
SCOPE AND SEQUENCE:
Social Studies and Science

	SOCIAL STUDIES FOCUS: INTERDEPENDENCE	SCIENCE FOCUS: INVESTIGATION
Early Childhood	**Investigating Our World** -Combined Social studies and Science -Responsibility and Cooperation -Using the Talents -Oviparous Animals -Fish	
PRI I	**Ourselves and Others** -History of Holidays -Life in Other Countries	-Animals: Insects, Reptiles, Birds, Fish, Amphibians, Mammals, Undersea creatures -Water: Floating, Rust, Evaporation -Plants: Flowers, Roots, Stems
PRI II	**Living Together at Home and School** -Rules and Manners -Problem Solving -Cooperation -Review of Holiday History	**Investigating Changes Around Us** -Magnetism & Electricity -Behavior of Matter: Solids, Liquids, and Gases -Animal Hibernation -Soil and Plant Growth
PRI III	**Interdependence of Communities and Regions in the U.S.** -Economic and Consumer Education -Form of government -Major U.S. Historical events	**Investigating Life Cycles** -Studies and experiments with plants **Investigating Our Environment** -Matter: Solids, liquids, gases -Magnetism -Use of the Compass
INT I	**Interdependence of Communities and Regions of the World** -Land forms influence on climate, economics and culture -Global perspective of Interdependence -Study of states and Presidents of U.S. -Major World History Events	**Investigating Our Environment** -Solar System -Geology -Matter: States of matter, chemical changes, physical changes -Machines -Health -Plants -Environment: Ecology and communities -Compass

	SOCIAL STUDIES FOCUS: INTERDEPENDENCE	SCIENCE FOCUS: INVESTIGATION
Older INT	**America and the World Community** -History, geography, government -Reading of biographies, historical fiction and non-fiction -Land forms, climate, land use products -Maps and Globes	**Investigating Our Environment** -Weather -Magnetism -Ecology -Air -Water -Pollution -Electricity -Plant and Animal Growth and Response -Flight (aerodynamics) -Properties of Matter -Weights and Measures -Sound -Light -Compass -Machines -Chemistry, including acid/base and pH

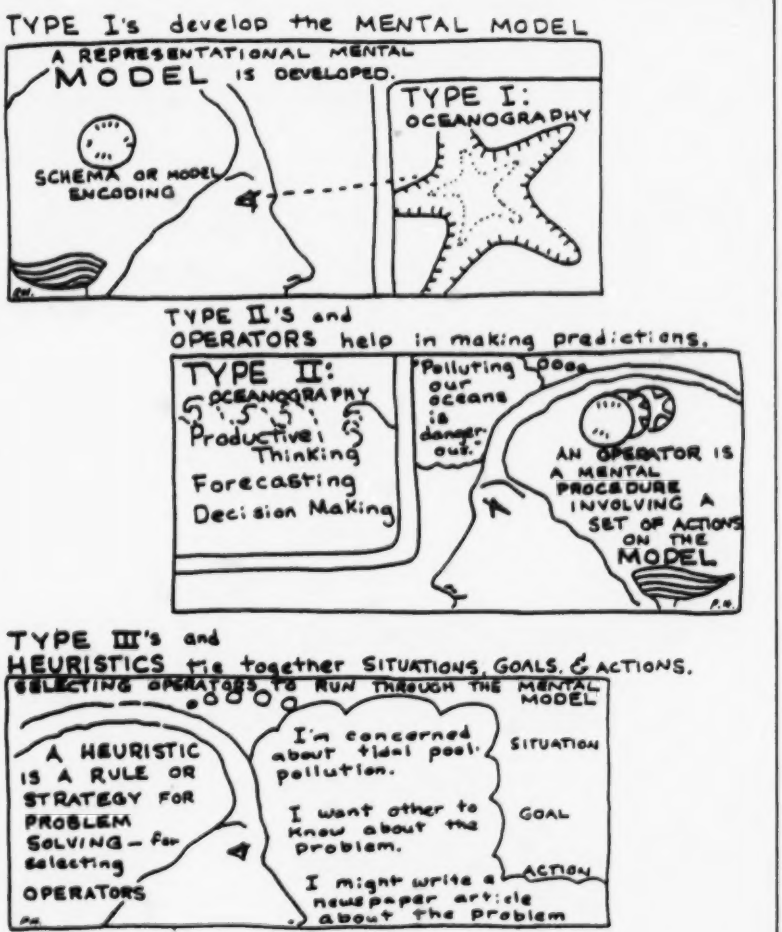
Enaction Theory: A Theoretical Validation of the Enrichment Triad Model

Patricia L. Hollingsworth

Enaction Theory postulates that thinking occurs when an internal mental model undergoes mental manipulations with the guidance of heuristics. The purpose of this paper is to show similarities and relationships between Enaction Theory and the Enrichment Triad Model that seem to lend theoretical validity to Triad in terms of facilitating reflective thinking or problem solving.

***Patricia L. Hollingsworth** (Ed.D.), is the Director of the University of Tulsa School for Gifted Children in Tulsa, Oklahoma. She is a professional writer and artist who has presented workshops on parenting and the arts both locally and nationally.*

Figure 1
Relationships between Enaction Theory & Enrichment Triad


TYPE I's develop the MENTAL MODEL
A REPRESENTATIONAL MENTAL MODEL IS DEVELOPED.
SCHEMA OR MODEL ENCODING
TYPE I: OCEANOGRAPHY
TYPE II's and OPERATORS help in making predictions.
TYPE II: OCEANOGRAPHY
Productive Thinking
Forecasting
Decision Making
Polluting our oceans is dangerous.
AN OPERATOR IS A MENTAL PROCEDURE INVOLVING A SET OF ACTIONS ON THE MODEL
TYPE III's and HEURISTICS tie together SITUATIONS, GOALS, & ACTIONS.
SELECTING OPERATORS TO RUN THROUGH THE MENTAL MODEL
A HEURISTIC IS A RULE OR STRATEGY FOR PROBLEM SOLVING — for selecting OPERATORS
I'm concerned about tidal pool pollution.
SITUATION
I want other to know about the problem.
GOAL
I might write a newspaper article about the problem
ACTION

Enaction Theory of Thinking (Ohlsson, 1983) postulates that thinking is a matter of running a simulation of the world through one's head. This simulation occurs as a representational mental model undergoes mental manipulations under the guidance of heuristics. Extensive research by Newell and Simon (1972) provides the basis of Enaction Theory. Thinking in this model, as in psychological theory and research (Bolton, 1972), will be closely identified with problem solving. John Dewey's (1933) similar concept, reflective thinking, refers to thinking that involves "turning a subject over in the mind and giving it serious and consecutive consideration" (p.3).

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The purpose of this paper is to show ways in which the Enrichment Triad Model (Renzulli, 1977) appears to facilitate thinking or problem solving according to the Enaction Theory of Thinking. This paper will deal with relationships and similarities between Enaction Theory and the Enrichment Triad Model that seem to lend theoretical validity to the Triad Model.

The Enrichment Triad, a widely used model in gifted education, was designed to provide an enrichment program for highly able youth. The Enrichment Triad consists of Type I Enrichment activities, which are general exploratory experiences; Type II Enrichment activities, which are group and individual training activities designed to develop higher level thinking processes, research and reference skills, and personal and social development; and Type III Enrichment activities, which involve individual and small group investigations of real problems that are presented to appropriate audiences.

Mental Models and Type I Enrichment

The first stage in Enaction Theory is the development of a mental representation, model, or schema that can be defined as an abstract cognitive model of a concept with a network of interactions similar to the major elements of the object system (Rumelhart, 1977). A mental representation is not necessarily a visual image but rather a model that is in some functional ways like the object system which it represents. Ohlsson (1983) says that our internal conceptions are more like formulas, holograms, musical scores, drawings or paintings than they are like texts in books. Our encoded mental models do not seem to be propositional like words in a book. Research by Dean and Kulhavy (1981) and Mastropieri and Scruggs (1984) supports Enaction Theory's contention that much information is encoded non-propositionally.

In Type I Enrichment, students are exposed to a spectrum of new ideas, topics, and fields of knowledge not ordinarily covered in the regular curriculum, in the form of speakers, field trips, media presentations, and interest development centers (Renzulli, 1984). For example, and oceanographer might give a presentation to an elementary school on marine ecosystems.

Students involved in the Type I experience on marine ecosystems begin to develop a rudimentary internal mental model of how plants and animals live together in oceans. Enaction Theory indicates that high personal involvement with objects systems facilitates the development of a representational mental model. Type I experiences often provide professionally trained persons to present hands-on, highly involving materials to get students excited about new knowledge (Reis, Atamian, & Renzulli, 1985). Because Type I experiences are usually with working professionals in the field, the information gained is more likely to be accurate, current, enthusiastic, and involving the tools and materials of the trade. All of these elements contribute to the development of an accurate, useful mental representation. In order to develop a mental model, one must discover the relevant aspects of the object system in the world (Johnson-Laird, 1980). Type I experiences provide opportunities for students to learn in both propositional and non-propositional ways. For example, a unit on astronomy began with a lecture, an observational experience, and use of a telescope (Reis, Atamian, & Renzulli, 1985). Students in Type I Enrichment are involved in gaining knowledge experientially and are thus more likely to grasp and encode the relevant aspects of an object system. Type I Enrichment seems to be fertile ground for the encoding of a mental model.

Operators and Type II Enrichment

According to Enaction Theory, every object system has a set of actions that can be performed upon it. One's mental model undergoes changes just as the object system in the external world undergoes changes. These mental changes, operators, allow a person to predict an outcome. For example, a houseplant can be watered, fertilized, sprayed for insects, transplanted, transported, dropped, neglected, pruned, etc. Each of these actions is mirrored internally by a mental procedure or operator. By applying an operator, a person can think ahead to what the plant will be like if it is not watered. The person will be able to predict that lack of water will cause the plant to die.

A model and a set of operators are a system that can be run by a succession of the operators. A thought process could be described as a mental model passing through a sequence of accumulating changes. The changes are analogous to the changes that can actually occur to the object system in the world. An operator contains process or procedural knowledge, while a model contains representational knowledge. Dewey (1933) seemed to have the concept of operators in mind when he wrote "in any reflective thought definite units . . . are linked together so that there is a sustained movement to a common end" (p.5).

Type II experiences are methods and materials designed to develop a broad range of thinking and feeling processes (Renzulli & Reis, 1985). There are four parts to the Taxonomy of Type II Enrichment Processes: (a) Cognitive and Affective Training; (b) Learning How-to-Learn Skills; (c) Using Advanced Research and Reference Materials; and (d) Developing Written, Oral, and Visual Communication Techniques (Renzulli & Reis, 1986). In the previously mentioned unit on astronomy (Reis, Atamian, & Renzulli, 1985) the Type II training involved observing the night sky and keeping records of objects and events for a period of three months. Students were observing changes in the physical world and, according to Enaction Theory, were mirroring those changes internally. In other words, students were developing operators with which they can predict outcomes related to the object system, in this case, astronomy. Another example of Type II training was designed to increase syntactic maturity and creativity of students' writing (Stoddard & Renzulli, 1983). In this case, the students were learning the procedures for writing in a more mature and creative way. Ohlsson (1983) stresses the importance of emphasizing the procedural aspects of all kinds of content. Talents Unlimited (Schlichter, 1981), which can be used as Type II training, teaches students the procedures for planning, forecasting, communication, productive thinking, and decision making within any academic area. For example, if students had participated in a Type I on marine ecology, the group might use the productive thinking procedure to discuss the many, varied, and unusual things that live in oceans. Later, students might be asked to use their forecasting talents to tell what might happen if we pollute our tidal pools. Or students might focus on a particular problem in marine ecology by using the decision making procedure. When the problem becomes focused, the teacher can help students identify and locate materials and resources that will develop process skills related to the problem (Reis & Renzulli, 1985).

It is fairly easy to see the connections between operators in Enaction Theory and Type II Enrichment activities. First, Type II Enrichment activities are concerned with mental processes, such as productive thinking, critical thinking,

and decision making. All of these processes are operators on the mental model that developed through encoding experiences like those in Type I Enrichment. Second, Type II activities are concerned with physical processes, such as note taking, library skills, photography, and a variety of information retrieval skills. These physical processes are internally mirrored as operators that change and develop the mental model. The model and set of operators become a source for making assumptions, inferences, and predictions. For Glaser (1984), schema is both model and operator for his definition includes schema as an internal model and as a source of prediction. Even so, his quote is quite applicable. Schema or models and operators "play a central role in thinking and understanding, and the reasoning that occurs takes place in the context of these specific networks of knowledge" (Glaser, 1984, p.100).

Heuristics and Type III Enrichment

Heuristic knowledge, according to Enaction Theory, is the ability to decide which actions and procedures are best in a given situation. Heuristics are rules but they are not algorithms. "An algorithm is a systematic plan that guarantees the solution of a given problem..." (Bolton, 1972, p.168). A heuristic does not guarantee a solution but rather facilitates problem solving by connecting situations, actions, and goals to make thinking more effective. A set of heuristics (rules) becomes a problem solving strategy acting as a guide for thinking. Heuristics are used to select operators to be processed through the mental model.

In the Enrichment Triad Model when students become sincerely interested in specific topics, they are encouraged to conduct a Type III first-hand investigation of a real problem for a real audience. This will not just be a report of already existing material to be hung on the refrigerator. Previous knowledge is a starting point, not an end in Type III investigations. Students must focus upon a problem in their interest area, use the methodology of the field, and present the product to an appropriate audience.

Type III investigations can be the means to developing heuristics. If the goal becomes alerting people to the effects of a polluted tidal pool, then it also becomes the problem. There is not a ready-made algorithm. "For the situation to stimulate thinking, it must... form an obstacle in the way of goal-directed activity" (Bolton, 1972, p.5). For a Type III investigation, the learner brings into play the mental model of the object system and under the guidance of heuristics selects operators related to the problem to run through the model. Simplistically put, the thinking might go as follows, "I need to make an operator selection. Let's see, in Type II training I've learned some problem solving strategies. I'll try those out on my mental model of tidal pool ecology in order to generate some solutions. I've also learned some other Type II skills such as writing, videotaping, and interviewing. Aha! I think I've got a way to begin solving this problem." One of the objectives of Type III Enrichment is to provide an opportunity for students to apply their knowledge and methodological skills to a problem of their own choosing. If one views knowledge as the mental model and methodological skills as operators upon the model, then the solution to the problem could be viewed as a heuristic or set of heuristics. The learner connects the situation (concern for the marine environment) with the goal (to alert the public to the problem) with appropriate actions (focus the problem, use appropriate methodology to gather data, produce a product dealing with the problem, and present it to an audience). (See Figure 1.)

Neither Enaction Theory nor the Enrichment Triad Model are to be thought of as purely linear. Both are interactive. A student might begin with a Type III investigation but then need to go back and gain Type I knowledge and or Type II process skills. The same is true with thinking according to Enaction Theory, one might be given a rule but have to develop a more complete mental model or new operators in order to use it. Since the Enrichment Triad goes beyond thinking into product development, one student's Type III investigation can become another's Type I Enrichment.

Conclusion

Though Enaction Theory is a theory of how humans think, Ohlsson (1983) believes it has educational implications. And indeed, Enaction Theory has been used to develop school curriculum (Hollingsworth, 1985). Ohlsson recommends that students be taught to think or problem solve by teaching them representational, procedural, and heuristic knowledge. It appears that the Enrichment Triad Model does. Triad provides Type I Enrichment to develop the representational mental model. Type II Enrichment is concerned with processes which can act as operators upon the mental model. Triad encourages students to complete Type III investigations, in which students must problem solve. In the light of Enaction Theory, this means that students are developing rules to help them select operators that will help them come to a solution.

Dewey (1933) wrote that reflective thinking impels the thinker to inquire — to find out. It may be that one of the reasons for Triad's success in impelling students to find out is that it is based on a method of reflective thinking and problem solving. To the extent this is true, Enaction Theory seems to be a theoretical validation of the thinking and problem solving aspects of the Enrichment Triad Model.

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